

# MARAIS DES CYGNES BASIN TOTAL MAXIMUM DAILY LOAD

**Waterbody: Marais des Cygnes River**

**Water Quality Impairment: Selenium**

## 1. INTRODUCTION AND PROBLEM IDENTIFICATION

**Subbasin:** Upper Marais Des Cygnes      **County:** Franklin, Osage and Coffey

**HUC 8:** 10290101

**HUC 11 (HUC 14s):**      **020** (010, 020, 030, 040 and 050)  
                                 **040** (020, 030 and 060)

**Drainage Area:**                      329 square miles

**Main Stem Segments:**      WQLS: 14, 15, 17, 18, 19, 28, 30, 31 and 32; starting at confluence with Eight Mile Creek and traveling upstream to confluence with Frog Creek in southeastern Osage County (**Figure 1**).

**Tributary Segment:**      WQLS: Coal Creek (48)  
                                 Non-WQLS: Hard Fish Creek (47)  
                                 WQLS: Dry Creek (95)  
                                 WQLS: Tequa Creek (44)  
                                                      S. Br. Tequa Creek (45)  
                                                      E. Br. Tequa Creek (46)  
                                 WQLS: Rock Creek (43)  
                                                      Willow Creek (94)  
                                                      Little Rock Creek (73)  
                                 WQLS: Frog Creek (42)

**Designated Uses:**                      Special Aquatic Life Support for Main Stem Segments 14, 15 and 17; Expected Aquatic Life Support for Main Stem Segments 18, 19, 30, 31 and 32; Primary Contact Recreation; Domestic Water Supply; Food Procurement; Ground Water Recharge; Industrial Water Supply Use; Irrigation Use; Livestock Watering Use for all Main Stem Segments.

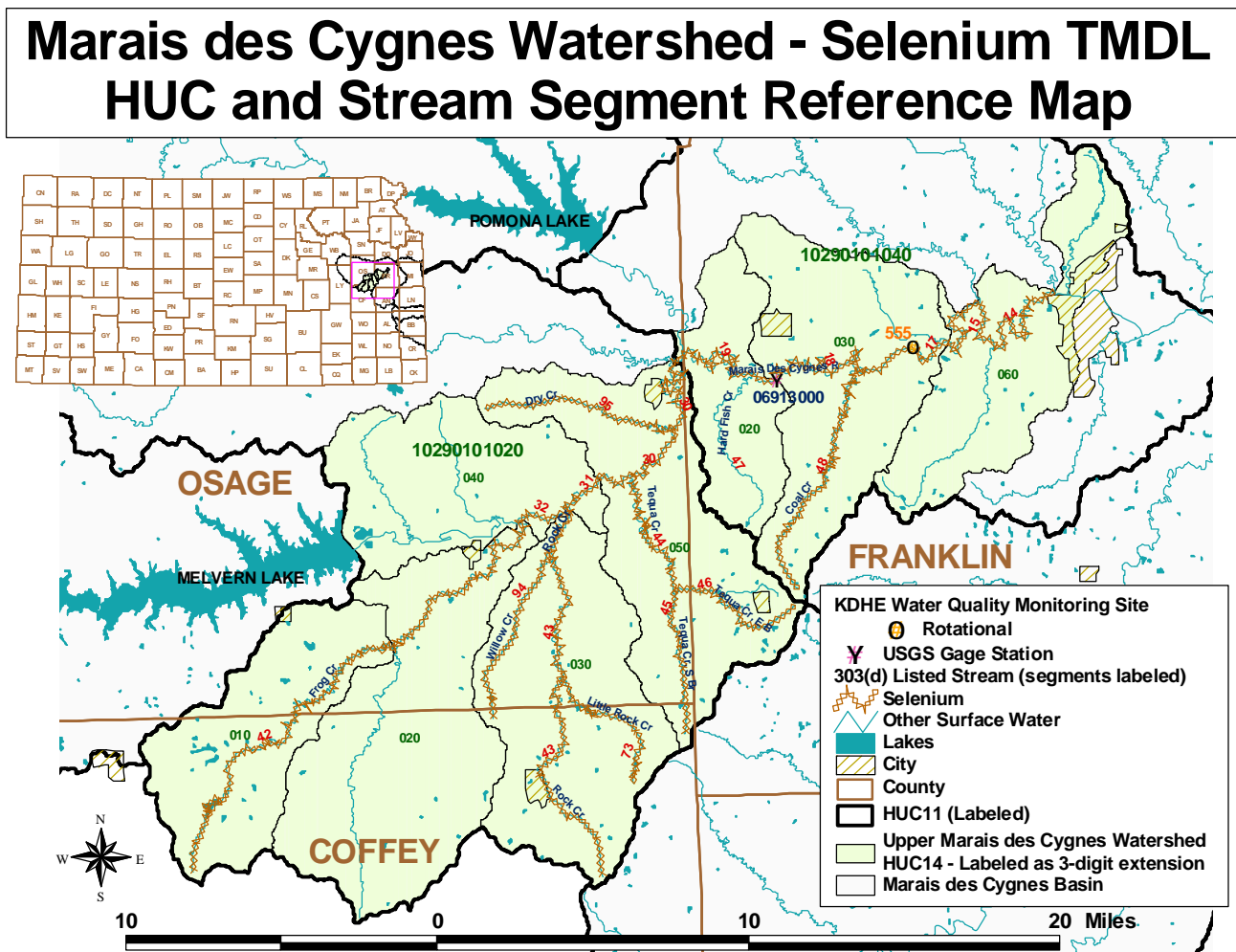
Special Aquatic Life Support and Secondary Contact Recreation for Frog Creek; Expected Aquatic Life Support and Secondary Contact Recreation for remaining Tributaries; Food Procurement for E. Br. Tequa Creek and Rock Creek; Domestic Water Supply; Ground Water Recharge; Industrial Water Supply Use; Irrigation Use; Livestock Watering Use for E. Br. Tequa Creek.

**1998 303(d) Listing:**                      Table 3 - Predominantly Natural Conditions

**Impaired Use:** Aquatic Life Support

**Water Quality Standard:** 5 Fg/liter for Chronic Aquatic Life (KAR 28-16-28e(c)(2)(F)(ii))

In stream segments where background concentrations of naturally occurring substances, including chlorides, sulfates and selenium, exceed the water quality criteria listed in Table 1a of KAR 28-16-28e(d), at ambient flow, the existing water quality shall be maintained, and the newly established numeric criteria shall be the background concentration, as defined in KAR 28-16-28b(e). Background concentrations shall be established using the methods outlined in the “Kansas implementation procedures: surface water,” dated June 1, 1999... (KAR 28-16-28e(b)(9)).



**Figure 1**

## 2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

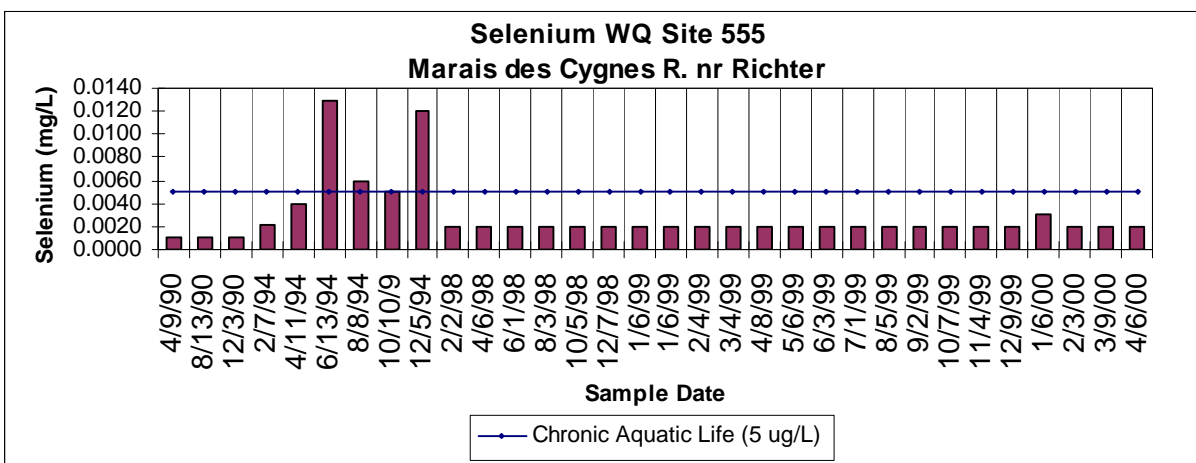
**Level of Support for Designated Use under 1998 303(d):** Not Supporting Aquatic Life

**Monitoring Sites:** Station 555 near Richter

**Period of Record Used:** 1990, 1994, 1998, 1999 and 2000 for Station 555 (**Figure 2**).

**Flow Record:** Marais des Cygnes River near Pomona (06913000); 1970 - 2000

**Long Term Flow Conditions:** Median Flow = 110 cfs, 7Q10 = 17 cfs



**Figure 2**

**Current Conditions:** Since loading capacity varies as a function of the flow present in the stream, this TMDL represents a continuum of desired loads over all flow conditions, rather than fixed at a single value. Annual flow duration data were determined from stream flow for the Marais des Cygnes near Pomona gage (06913000). High flows and runoff equate to lower flow durations; baseflow and point source influences generally occur in the 75-99% range. A load curve was established for chronic aquatic life criterion by multiplying the flow values along the curve by the applicable water quality criterion and converting the units to derive a load duration curve of pounds of selenium per day. These load curves represent the TMDL since any point along the curve represents water quality for the standard at that flow. Samples taken during each of the three defined seasons: Spring (April-July), Summer-Fall (August-October) and Winter (November-March), were plotted on the load duration curve. Historic excursions from the water quality standard are seen as plotted points above the load curves. Water quality standards are met for those points plotting below the applicable load duration curves (**Figure 5**).

An excursion was seen in each of the three defined seasons and these excursions are outlined in Table 1. Ten percent of Spring samples and 13% of Summer-Fall samples were over the criterion. Eight percent of Winter samples were over the chronic aquatic life criterion. Overall, slightly less than 10% of the samples were over the criteria. This would represent a baseline condition of full support of the designated use.

**Table 1**  
**NUMBER OF SAMPLES OVER SELENIUM STANDARD OF 5 ug/L BY FLOW**

| Sampling Site                              | Season | 0 to 10% | 10 to 25% | 25 to 50% | 50 to 75% | 75 to 90% | 90 to 100% | Cum Freq.  |
|--|--------|----------|-----------|-----------|-----------|-----------|------------|------------|
| Marais des Cygnes River near Richter (555) | Spring | 0        | 0         | 1         | 0         | 0         | 0          | 1/10 = 10% |
|  | Summer | 0        | 0         | 0         | 0         | 1         | 0          | 1/8 = 13%  |
|  | Winter | 0        | 0         | 0         | 0         | 1         | 0          | 1/13 = 8%  |

All excursions at Site 555 were in 1994. No excursions were noted at this site outside of that year.

The Marais des Cygnes watershed is not located in an area of Kansas that includes Cretaceous rocks which are generally the source of higher selenium concentrations in streams. This watershed is also not in an area of Kansas where evapotranspiration has concentrated salts in low areas of dryland farms (such as south-central Kansas) that could have led to higher selenium concentrations in streams following small flushing events. The basin does not appear to be particularly affected by irrigation. From this, it is believed that these selenium excursions were driven by a natural occurrence stemming from the unique climatic conditions immediately prior to and during 1994.

The early to mid parts of 1993 were particularly wet and resulted in very high values for the Palmer Drought Severity Index (PDSI) during the third quarter of 1993 in the northeast and east-central climatic divisions of Kansas. The climate then became normal to dry and the PDSI decreased rapidly at the end of 1993, especially in northeast Kansas. The decrease was not as rapid in east-central Kansas but continued through 1994. A possible mechanism might have been mobilization (but not flushing) of selenium in soils and plants during the wet period and then release to streams during the drier period of 1994 in comparison to that of 1993.

#### **Desired Endpoints of Water Quality (Implied Load Capacity) at Site 555 over 2002 - 2010:**

The ultimate endpoint for this TMDL will be to achieve Kansas Water Quality Standards fully supporting Aquatic Life. The endpoint will be to achieve the Aquatic Life value of 5 ug/L and this load curve is shown in the TMDL figure. Monitoring data plotting below the TMDL curve will indicate attainment of the water quality standards. Seasonal variation in endpoints is accounted for by notation of the sample date on the annual TMDL curve and will be evaluated based on monitoring data from 2002, 2006 and 2010. Achievement of the endpoints indicate loads are within the loading capacity of the stream, water quality standards are attained and full support of the designated uses of the stream has been restored. Excursions from the standard should be a consequence of unique natural conditions and not anthropogenic activity.

### **3. SOURCE INVENTORY AND ASSESSMENT**

**NPDES:** There are eleven NPDES permitted wastewater dischargers within the watershed

(Figure 3). These dischargers are outlined in Table 2.

**Table 2**

| FACILITY                                  | STREAM REACH                                     | SEGMENT | DESIGN FLOW | TYPE   |
|---|--|---------|-------------|--------|
| Beto Junction Travel Plaza                | Marais des Cygnes R. via Long Creek              | 42      | 0.0213 mgd  | Lagoon |
| Total Truck Stop                          | Marais des Cygnes R. via Long Creek              | 42      | 0.007 mgd   | Lagoon |
| Martin Marietta Aggregates Melvern Quarry | Marais des Cygnes R. via Long Creek              | 42      |             |        |
| Nelson Quarries Waverly Quarry            | Marais des Cygnes R. via Rock Creek              | 43      |             |        |
| Country Corner Groundwater Rem. Project   | Marais des Cygnes R. via Rock Creek              | 43      |             |        |
| Melvorn MWTP                              | Marais des Cygnes R. via Long Creek              | 42      | 0.065 mgd   | Lagoon |
| Pomona MWTF                               | Marais des Cygnes R.                             | 18      | 0.1 mgd     | Lagoon |
| Quenemo MWTF                              | Marais des Cygnes R.                             | 30      | 0.038 mgd   | Lagoon |
| Waverly MWTF                              | Marais des Cygnes R. via Rock Creek              | 43      | 0.090 mgd   | Lagoon |
| Williamsburg MWTF                         | Marais des Cygnes R. via Tequa Cr. via E.B Tequa | 46      | 0.055 mgd   | Lagoon |

**Livestock Waste Management Systems:** Twenty eight operations are registered, certified or permitted within the watershed (Figure 3). Potential animal units for all facilities in the watershed total 7,351. The actual number of animal units on site is variable, but typically less than potential numbers.

**Land Use:** Most of the watershed is grassland (54% of the area), cropland (35% of the area) and woodland (8% of the area). Based on 1998 water use reports, none of the cropland in the watershed was irrigated. Most of the cropland in the watershed is located along the Marais des Cygnes River and its tributaries (Figure 4). The grazing density estimate is low (24-30 animal units/mi<sup>2</sup>) for the upper half of the watershed and average to high (31-54 animal units/mi<sup>2</sup>) for the lower half of the watershed when compared to densities in the Marais des Cygnes and Missouri Basins.

**Background Levels:** Selenium loading may be associated with background levels, especially with the mobilization of selenium in soils and plants during the wet period and then release to water during the drier periods.

## Marais des Cygnes Watershed - Selenium TMDL NPDES Sites and Livestock Waste Management Facilities

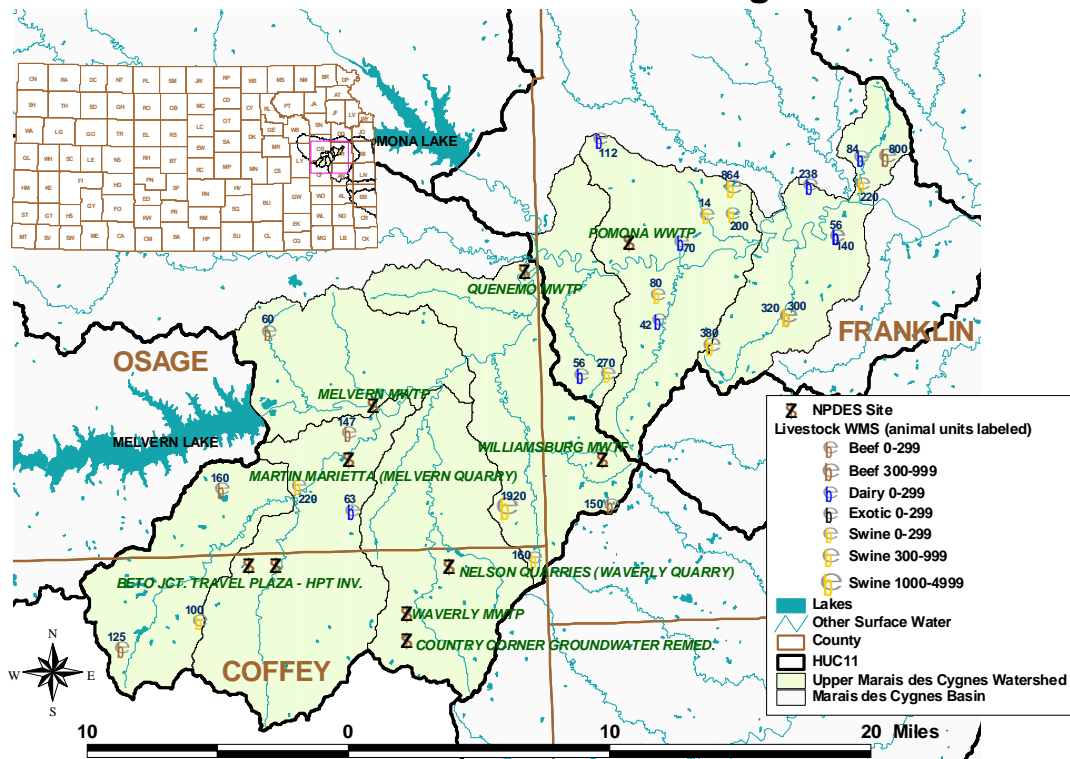


Figure 3

## Marais des Cygnes Watershed - Selenium TMDL Land Use

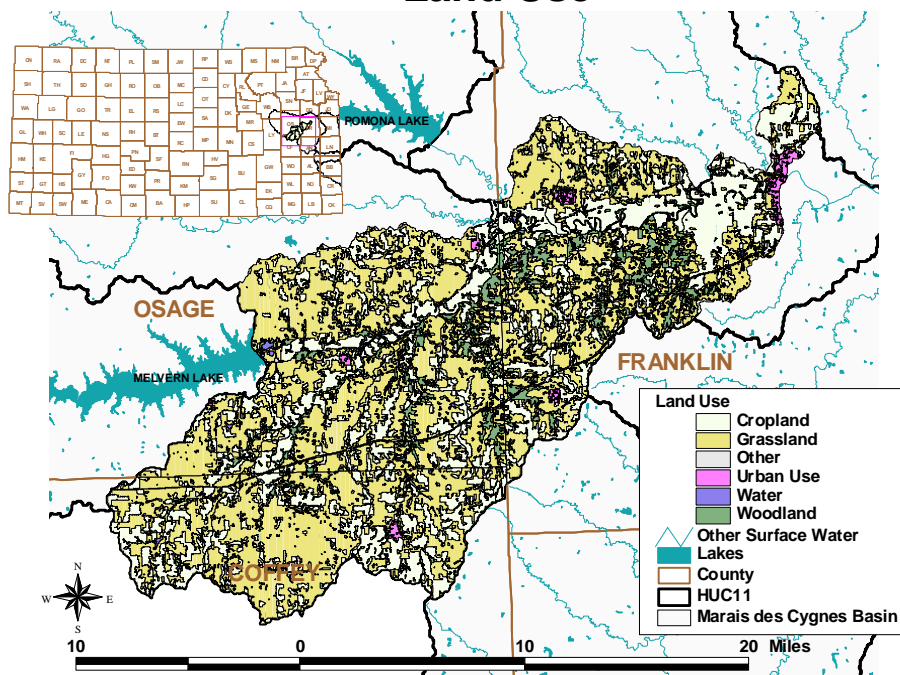


Figure 4

#### 4. ALLOCATION OF POLLUTION REDUCTION RESPONSIBILITY

The source assessment has ascertained that natural selenium loading within the watershed generally is responsible for the infrequent excursions seen in the Marais des Cygnes River.

**Point Sources:** Point sources are responsible for maintaining their systems in proper working condition and appropriate detention volumes to handle anticipated wasteloads of their respective populations. Ongoing inspections and monitoring of this system will be made to ensure that minimal contributions have been made by this source.

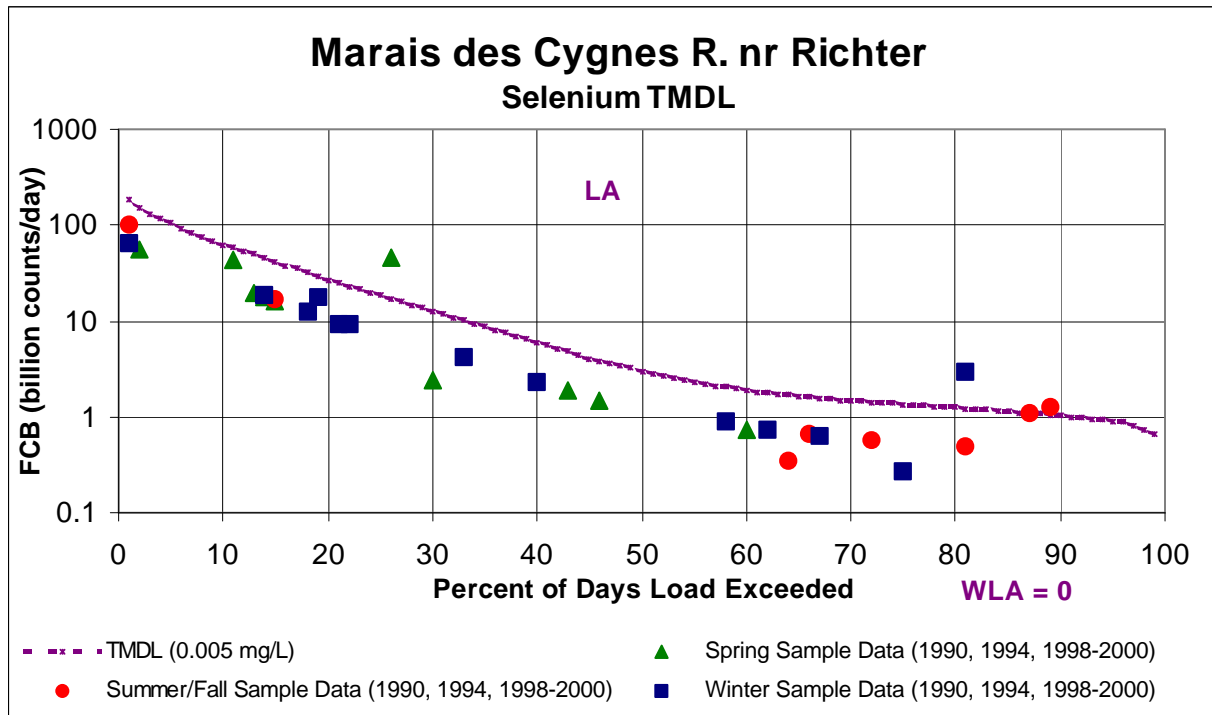
A Wasteload Allocation of zero will be established by this TMDL because of the presumed lack of point source influence on the selenium load in the watershed (**Figure 5**). Should future monitoring indicate point sources do contribute to the selenium load in impaired segments, the current wasteload allocation will be revised by adjusting current load allocations to account for the presence and impact of these point source dischargers.

Additionally, if future point sources are proposed in the watershed and discharge into the impaired segments and are found contribute to the selenium load, the current wasteload allocation will also be revised by adjusting allocations to account for the presence and impact of these new point source dischargers.

**Non-Point Sources:** The elevated selenium concentrations appear to be climatically driven in nature.

Without a Wasteload Allocation, the Load Allocation assigns responsibility for maintaining water quality across all flow conditions at Site 555. The Load Allocation based on the existing standard will range from 0.41 pounds per day at the 7Q10 of 17 cfs to 2.67 pounds per day at the median flow of 110 cfs (**Figure 5**).

**Defined Margin of Safety:** The Margin of Safety provides some hedge against the uncertainty of loading and the selenium endpoint will be ten percent of the applicable selenium load, or 0.046 pounds per day at 7Q10 and to 0.3 pounds per day at the median flow.



**Figure 5**

**State Water Plan Implementation Priority:** Because it appears this watershed's selenium load is predominately natural, this TMDL will be a Low Priority for implementation.

**Unified Watershed Assessment Priority Ranking:** This watershed lies within the Upper Marais des Cygnes River Subbasin (HUC 8: 10290101) with a priority ranking of 5 (High Priority for restoration work).

**Priority HUC 11s and Stream Segments:** Because of the natural, climatically driven contribution of this impairment, no priority subwatersheds or stream segments will be identified.

## 5. IMPLEMENTATION

### Desired Implementation Activities

1. Monitor any anthropogenic contributions of selenium loading to the creek.

### Implementation Programs Guidance

#### Non-Point Source Pollution Technical Assistance - KDHE

- a. Evaluate any potential anthropogenic activities which might contribute selenium to the river as part of an overall Watershed Restoration and Protection Strategy.



### **Water Quality Standards and Assessment - KDHE**

- a. Should occasional selenium violations be noted at Richter, conduct a special study of water quality between Melvern Reservoir and Richter in the Marais des Cygnes watershed.

**Time Frame for Implementation:** Continued monitoring in the year 2002 and 2006.

**Targeted Participants:** No targets until 2006 assessment.

**Milestone for 2006:** The year 2006 marks the midpoint of the ten-year implementation window for the watershed. At that point in time, additional monitoring data from Station 555 will be reexamined to confirm the impaired status of the streams within this watershed and determine the presence of any anthropogenic loading to the stream. Should the case of impairment remain, source assessment, allocation and implementation activities will ensue.

**Delivery Agents:** Depending upon confirmation of impairment and assessment of probable sources, the primary delivery agents for program participation will be the Kansas Department of Health and Environment.

### **Reasonable Assurances**

**Authorities:** The following authorities may be used to direct activities in the watershed to reduce pollution.

1. K.S.A. 65-164 and 165 empowers the Secretary of KDHE to regulate the discharge of sewage into the waters of the state.
2. K.S.A. 65-171d empowers the Secretary of KDHE to prevent water pollution and to protect the beneficial uses of the waters of the state through required treatment of sewage and established water quality standards and to require permits by persons having a potential to discharge pollutants into the waters of the state.
3. K.S.A. 82a-901, et seq. empowers the Kansas Water Office to develop a state water plan directing the protection and maintenance of surface water quality for the waters of the state.
4. K.S.A. 82a-951 creates the State Water Plan Fund to finance the implementation of the *Kansas Water Plan*.
5. The *Kansas Water Plan* and the Lower Arkansas Basin Plan provide the guidance to state agencies to coordinate programs intent on protecting water quality and to target those programs to geographic areas of the state for high priority in implementation.

**Funding:** The State Water Plan Fund annually generates \$16-18 million and is the primary funding mechanism for implementing water quality protection and pollutant reduction activities

in the state through the *Kansas Water Plan*. The state water planning process, overseen by the Kansas Water Office, coordinates and directs programs and funding toward watersheds and water resources of highest priority. Typically, the state allocates at least 50% of the fund to programs supporting water quality protection. This watershed and its TMDL are a Low Priority consideration and should not receive funding.

**Effectiveness:** Minimal control can be exerted on natural contributions to loading.

## 6. MONITORING

KDHE will continue to collect bimonthly samples in 2002 and 2006 at the rotational Station 555, including selenium samples. Based on that sampling, the status of 303(d) listing will be evaluated in 2010 including an impairment definition reflecting natural conditions. Should impaired status remain, the desired endpoints under this TMDL will be refined and direct more intensive sampling will need to be conducted under specified seasonal flow conditions after 2010.

## 7. FEEDBACK

**Public Meeting:** The public meeting to discuss TMDLs in the Marais des Cygnes Basin was held February 28, 2001 in Ottawa. An active Internet Web site was established at <http://www.kdhe.state.ks.us/tmdl/> to convey information to the public on the general establishment of TMDLs and specific TMDLs for the Marais des Cygnes Basin.

**Public Hearings:** Public Hearings on the TMDLs of the Marais des Cygnes Basin were held in Fort Scott on May 30 and Ottawa on May 31, 2001.

**Basin Advisory Committee:** The Marais des Cygnes Basin Advisory Committee met to discuss the TMDLs in the basin on October 4, 2000, February 28 and May 30, 2001.

**Milestone Evaluation:** In 2006, evaluation will be made as to the degree of implementation which has occurred within the watershed and current condition of the Marais des Cygnes River. Subsequent decisions will be made regarding the implementation approach and follow up of additional implementation in the watershed.

**Consideration for 303(d) Delisting:** The river will be evaluated for delisting under Section 303(d), based on the monitoring data over the period 2006-2010. Therefore, the decision for delisting will come about in the preparation of the 2010 303(d) list. Should modifications be made to the applicable water quality criteria during the ten year implementation period, consideration for delisting, desired endpoints of this TMDL and implementation activities may be adjusted accordingly.

**Incorporation into Continuing Planning Process, Water Quality Management Plan and the Kansas Water Planning Process:** Under the current version of the Continuing Planning Process, the next anticipated revision will come in 2002 which will emphasize revision of the

Water Quality Management Plan. At that time, incorporation of this TMDL will be made into both documents. Recommendations of this TMDL will be considered in *Kansas Water Plan* implementation decisions under the State Water Planning Process for Fiscal Years 2002-2006.